Remarks

Claims 1–5, 7–14, and 21–30 are pending in this application. Claims 6 and 15–20 have been canceled. Claims 1–2, 5, 9, and 13 have been amended to make editorial changes and in response to the office action. New claims 21–30 have been added to more specifically claim the invention. The new and amended claims are fully supported by the specification. No new matter has been added.

Section 102 and 103 Rejections

Claims 1–2, 5–11, 13–16, and 18–20 were rejected under section 102(e) as being anticipated by U.S. patent application publication 20060080630 (Lin). Claims 3 and 4 have been rejected under section 103(a) as being unpatentable by Lin in view of U.S. patent 6,857,113 (Gentry). Claims 12 and 17 have been rejected under section 103(a) as being unpatentable by Lin in view of U.S. patent 6,109,775 (Tripathi). Reconsideration of the rejection and allowance of the claims are respectfully requested.

Claims 1, 9, and 13

Claim 1 recites "a shape-based *automatic router tool*, capable of accessing the database, *using flood operations to create an interconnect route path for at least one net of the integrated circuit design*, selected using the graphical user interface tool and the mouse, wherein the interconnect route path comprises segments having different interconnect widths" (emphasis added).

Claim 9 recites "using *at least one flooding operation* to determine an interconnect route path between a first point and a second point of an integrated circuit design" (emphasis added).

Claim 13 recites "using *at least one flooding operation* to determine an interconnect route path between a first point and a second point of an integrated circuit design" (emphasis added).

Nowhere does Lin show or suggest an automatic router tool using flood operations in creating an interconnect route path. Rather, Lin is a layout floor planning tool to optimize power and ground (PG) wires. Lin does not describe shaped-based automatic routing using flood operations. Lin does not show or suggest the present invention and does not provide the features of the invention.

For at least this reason claims 1, 9, and 13 should be allowable. Claims 2–5, 7–8, and 21–22 are dependent on claim 1 and should be allowable for at least similar reasons as claim 1. Claim 10–12 are dependent on claim 9 and should be allowable for at least similar reasons as claim 9. Claim 14 is dependent on claim 13 and should be allowable for at least similar reasons as claim 13. The dependent claims recite additional limitations and should be further allowable because of these limitations.

Claims 3 and 4

Dependent claim 3, for example, additionally recites "a file, accessible by the automatic router tool, comprising *frequency information* for one or more nets of integrated circuit, wherein when frequency information is not provided for a net, DC operation of the net will be assumed" (emphasis added).

Claim 4 recites "a file, accessible by the automatic router tool, comprising *frequency information* for one or more nets of integrated circuit, wherein when frequency information is not provided for a net, a warning message is presented" (emphasis added).

The prior art does not show or suggest taking into consideration frequency information for the nets. Nowhere does Lin discuss frequency information because Lin is concerned with optimization of power and ground wires, which are static or DC wires. Lin alone does not anticipate these claims.

Further, there is *no motivation or suggestion to combine* Lin with Gentry. Gentry describes a technique of identifying nets that are at risk for electromigration due to alternating current and capacitance. One of skill in the art would not combine Lin with Gentry. Gentry's approach is inapplicable to Lin since the DC power and ground lines do not have signal transitions as envisioned in Gentry. Therefore, there is no motivation to combine these references, especially in the way the examiner suggests. For at least this reason, these claims should be allowable.

Even if Lin were combined with Gentry, and there is no suggestion to do this for the above reason, the combination would *fall short* of the invention. The combination of Lin and Gentry would be a tool having power and ground wire optimization and electromigration identification of signal lines. The electromigration portion of the tool would operate independently of any power and ground wire optimizations since these techniques work on different aspects of an integrated circuit design. There would be no file accessible by an

automatic router tool (the PG optimization tool is not an automatic router) that includes frequency information. Certainly no "warning message" (as recited in claim 4) would be presented if frequency information is not provided for a net. The combination of Lin and Gentry does not show or suggest the invention and does not provide the features of the invention.

Therefore, claims 3 and 4 should be allowable for these additional reasons.

Claims 12 and 14

Claim 12 recites "wherein the design rule is an *optical proximity effect correction rule*" (emphasis added).

Claim 14 rectites "wherein the design rule addresses at least one of current density, *optical proximity effects*, current handling, power handling, reliability, electromigration, voltage drop, or self-heating" (emphasis added).

Nowhere does Lin show or suggest power and ground optimization with respect to optical proximity effect correction. Lin alone does not anticipate these claims.

Further, there is *no motivation or suggestion to combine* Lin with Tripathi. Tripathi discusses forming additional lines in a layout to counter optical proximity effects, which is not considered in Lin whatsoever. In fact, when forming additional lines, this reduces the amount of available space for Lin's optimizations to power and ground wires. Consequently, there is no motivation to combine these references. For at least this reason, these claims should be allowable.

Even if Lin were combined with Tripathi, and there is no suggestion to do this for the above reason, the combination would *fall short* of the invention. The combination of Lin and Gentry would be a tool with power and ground wire optimization and optical proximity correction by forming additional lines. The optical proximity correction portion of the tool would operate independently of any power and ground wire optimizations since the techniques work on different aspects of an integrated circuit design. There would be no design rule upon which a width of an interconnect would be based. The combination of Lin and Tripathi does not show or suggest the invention and does not provide the features of the invention.

Therefore, claims 12 and 14 should be allowable for these additional reasons.

Claim 21

Claim 21 recites first net, a second net, and a third net, each of the first, second, and third nets carrying *different signals*. Lin does not show or suggest this feature of the invention where there at least three nets carrying at least three different signals, each of the nets having segments with different widths. Claim 21 should be allowable for this additional reason.

Claim 22

Claim 22 recites "wherein the automatic router tool performs *detailed routing*" (emphasis added). Lin does not describe a *detailed router* which creates a interconnect route path with segments having different interconnect widths. See Lin, paragraphs 62–64 and 73 which discuss global routing. Claim 22 should be allowable for this additional reason.

Claim 23

Claim 23 recites "an automatic shape-based router tool, capable of accessing the database, using a *batched greedy algorithm* to create an interconnect route path for at least one net of the integrated circuit design, selected using the graphical user interface tool and the mouse, wherein the interconnect route path comprises segments having different interconnect widths" (emphasis added). The cited prior art does not show or suggest using a batched greedy algorithm to create and interconnect route path. For at least this reason, claim 23 should be allowable.

Claims 24 and 25

Claim 24 recites "a file, accessible by the shape-based automatic router tool, comprising a current density table comprising current density *as a function of net frequency*" (emphasis added).

Claim 25 recites "a file, accessible by the shape-based automatic router tool, comprising *frequency information* for one or more nets of integrated circuit" (emphasis added).

As has been discussed, the prior art does not show or suggest an automatic router tool having access to a file with frequency information. Claims 24 and 25 should be allowable. Claims 26–29 are dependent on claims 24 or 25 and should be allowable for at least similar reasons.

Further, claim 28 and 29 recite "the shape-based automatic router tool uses a *batched greedy algorithm* to create the interconnect route path" (emphasis added). As has been stated, the

cited prior art does not show or suggest this feature of the present invention. For this additional reason, claims 28 and 29 should be allowable.

Claim 30

Claim 30 recites "creating an interconnect line for the interconnect route path having a width based on the property of the interconnect route path and *optical proximity effects*" (emphasis added). As has been discussed, the prior art does not show or suggest the recited feature of the invention. For at least this reason, claim 30 should be allowable.

Conclusion

For the above reasons, applicants believe all claims now pending in this application are in condition for allowance. Applicants respectfully request that a timely Notice of Allowance be issued in this case. If the examiner believes a telephone conference would expedite prosecution of this application, please contact the signee.

Respectfully submitted,

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